PATENT SPECIFICATION 1,021,378

DRAWINGS ATTACHED.

1,021,378

Date of filing Complete Specification: Nov. 2, 1964.

Application Date: Dec. 17, 1963. No. 49892/63.

Complete Specification Published: March 2, 1966.

Index at Acceptance:—F1 B(1D10, 2A10B, 2A11B, 2A13B, 2A18).

Int. Cl.:—F 02 b.

COMPLETE SPECIFICATION.

Two-Stroke Internal Combustion Engines.

We, THE VILLIERS ENGINEERING COMPANY LIMITED, a British Company, of Marston Road, Wolverhampton, Staffordshire, and BERNARD HOOPER, a British Subject, of the Company's address, do hereby declare the invention, for which we pray that a patent may be granted to us, and the method by which it is to be performed, to be particularly described in and by the following statement:—

This invention relates to two-stroke internal combustion engines of the kind using crankcase compression and is particularly concerned with the transfer porting for cylinder charging purposes. The objects of the invention include the provision of improved cylinder charging, reduction of piston crown temperatures and improved lubrication and cooling of the small end bearing.

According to the present invention we provide a two-stroke internal combustion engine using crankcase compression the cylinder of which has an exhaust port, a pair of main transfer ports disposed symmetrically with respect to the exhaust port and a pair of auxiliary transfer ports, one between each main transfer port and the exhaust port, said auxiliary transfer ports being connected with the interior of the piston adjacent the crown thereof by transfer passages and registering slots in the piston skirt.

The invention will now be described by way of example and with reference to a preferred embodiment shown somewhat diagrammatically in the accompanying drawings, in which:—

Figure 1 is a sectional elevation of a single cylinder two-stroke internal combustion engine of the kind using crankcase compression, the section being taken in the axial plane in which the exhaust port lies.

Figure 2 is a section taken on the lines 2—2 in Figure 1,

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Figure 3 is a sectional plan taken on the line 3—3 in Figure 2,

Figure 4 is a fragmentary section taken on the line 4—4 in Figure 3.

Referring to the drawings, 10 is the engine crankcase, 11, 11 are crankdiscs which rotate in the crankcase 10 and between which is mounted, on a crankpin 12 and by means of its big end bearing 13, a connecting rod 14, the small end bearing 15 of which is connected, by means of a hollow gudgeon pin 16, to the skirted piston 17 which operates in the cylinder bore 18 to control, during the compression and expansion strokes and in correct sequence, the exhaust port 19 and five transfer ports hereinafter described.

There are two main transfer ports 20 one on either side of the axial plane containing the exhaust port 19. Both ports 20 are directed at an inclination toward the cylinder head (not shown) and away from the exhaust port 19 to a point in said axial plane which is further from the exhaust port 19 than is the cylinder axis. These main transfer ports 20 are placed in constant communication with the lower end of the cylinder 18 by transfer passages 21, the lower portion of the piston skirt being formed with cut-aways 22 to register with the lower ends of said transfer passages 21 so as not to obstruct them. Said transfer ports 20 are controlled by the piston 17 which operates to uncover them after it has commenced to uncover the exhaust port 19 so that the products of combustion are scavenged from the cylinder 18 by the fresh charge displaced from the crankcase. A further transfer port 23 is provided diametrically opposite the exhaust port 19 and is directed toward the cylinder head at an inclination to a plane at right angles to the cylinder axis somewhat greater than the inclination to said plane of the two main transfer ports 20. This further trans-

fer port 23 commences to be uncovered by the piston 17 slightly later than the main transfer ports 20 and it is connected, by a comparatively short transfer passage 24 and an axially registering slot 25 in the piston skirt, with the upper interior zone of the piston 17, thereby affording a measure of cooling of the piston crown and small end bearing 15 and lubrication of the latter.

Two auxiliary transfer ports 26 are disposed one on each side of the exhaust port 19 and between the latter and the respective main transfer ports 20. Said auxiliary transfer ports 26 are directed away from the exhaust port 19 toward a point in the said axial plane which is further from the exhaust port than is the cylinder axis and are directed toward the cylinder crown at an inclination to a plane at right angles to the cylinder axis which is less than the inclination of the third transfer port 23 to said plane.

The auxiliary transfer ports 26 commence to be uncovered by the piston 17 a little later than does further transfer port 23 and they are connected by comparatively short transfer passages 27 and respectively registering slots 28 in the skirt of the piston 17 with the interior zone of the latter, thereby enhancing or supplementing the cooling and lubricating effects upon the piston crown and the small end bearing 15 of the connecting rod 14.

The dispositions of the two main transfer ports 20, the further transfer port 23 and the two auxiliary transfer ports 26 are symmetrical with respect to the axial plane in which the exhaust port 19 is disposed.

Points 29 and 30 at which the projected directions from the two main transfer ports 20 and the two further auxiliary transfer ports 26 respectively intersect are in said axial plane disposed on a line 31 which is parallel with the cylinder axis. The inclinations of said auxiliary transfer ports 26 intersect each other in said line 31 at the same point as the latter is intersected by the inclination of the further transfer port 23 (see particularly Figures 1 and 2). The line 31, which is disposed in said axial plane and in that half of the cylinder bore 18 remote from the exhaust port 19 is preferably situated at a distance from the cylinder axis of from 25% to 35% of the cylinder bore diameter, the point 29 is spaced from the top edge of the piston 17 at bottom dead centre by a distance of from 35% to 50% of the piston stroke, and the point 30 is spaced by a distance of from 20% to 35% of said stroke from the top edge of the piston 17 when the latter is at bottom dead centre.

The projected directions of the transfer ports are to be considered as projections of the directions of flow of fluid from the respective transfer passages when the piston is in the bottom dead centre position as shown in Figure 1.

WHAT WE CLAIM IS:—

1. A two-stroke internal combustion engine using crankcase compression the cylinder of which has an exhaust port, a pair of main transfer ports disposed symmetrically with respect to the exhaust port and a pair of auxiliary transfer ports, one between each main transfer port and the exhaust port, said auxiliary transfer ports being connected with the interior of the piston adjacent the crown thereof by transfer passages and registering slots in the piston skirt.

2. An engine as claimed in Claim 1 which includes a further transfer port disposed diametrically opposite the exhaust port.

3. An engine as claimed in Claim 2 in which the transfer ports are arranged so that, during a working stroke of the piston, said further transfer port is uncovered after the main transfer port and before the auxiliary transfer ports.

4. A two-stroke internal combustion engine having transfer porting substantially as hereinbefore described with reference to and as shown in the accompanying drawings.

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Abingdon: Printed for Her Majesty's Stationery Office, by Burgess & Son (Abingdon), Ltd.—1966.
Published at The Patent Office, 25 Southampton Buildings, London, W.C.2,
from which copies may be obtained.

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1 SHEET This drawing is a reproduction of the Original on a reduced scale

Fig. 1.

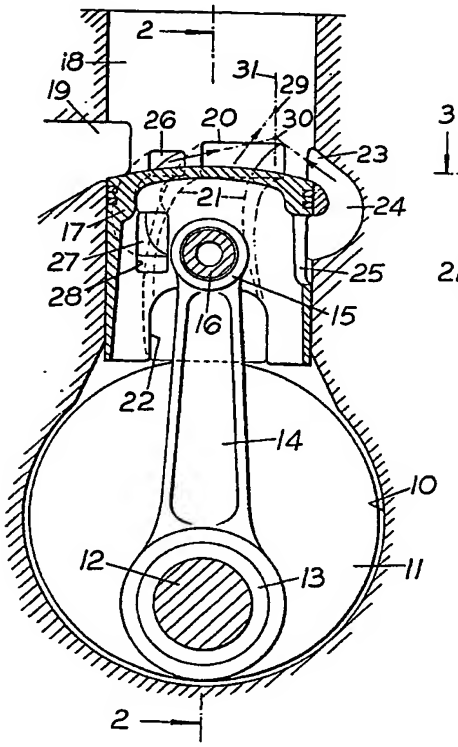

Fig. 2.

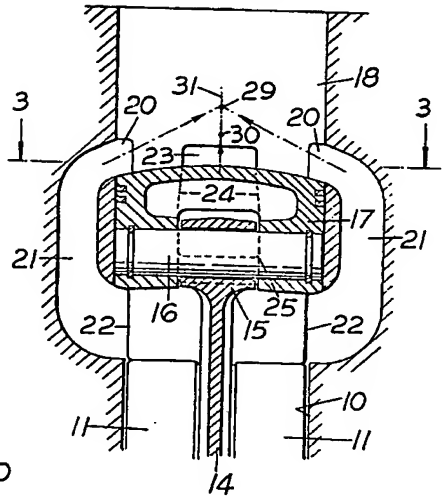

Fig. 3.

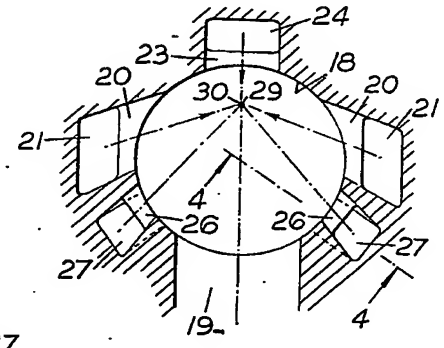

Fig. 4.